

REMARKS/ARGUMENTS

Claims 1-5 were pending in the present application. The present response does not amend, cancel, or add any new claims, leaving pending in the application claims 1-5. Reconsideration of the rejected claims and consideration of the newly presented claims is respectfully requested.

I. Election of the Claims

Pursuant to the election of Group I, claims 6-13 are canceled from the present application. Although indicated as withdrawn from consideration, the claims are indicated herein as being canceled as a matter of record.

II. Objection to the Drawings/Specification

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) for failing to include reference signs mentioned in the description. Reference 106 for the pitch in Fig. 2B has been removed from the description in order to avoid any confusion that the pitch of Fig. 2B must be the same as the pitch of Fig. 1B. The pitch is labeled in the figure and described in the specification, such that a reference character is not necessary. Applicants respectfully submit that reference 605 was not found in the specification with regard to Fig. 6A. It was found, however, that reference 608 used to denote upper and lower layers 608U and 608L, respectively, which could be confusing, and have amended the specification to specifically call out 608U and 608L to conform to the rest of the specification and the figures. If reference 608 was not what was intended by the Examiner, and a reference 605 does exist, Applicants respectfully request that the Examiner contact the undersigned attorney in order to ensure the completeness of this response and to avoid unintentional abandonment of the application. With regard to reference 702, it was recognized that there could be confusion by referring to each test pattern (including patterns 702X, 702Y and 702XY) using a single reference 702, such that the reference character has been removed from the specification. The test patterns each are labeled in the figure and described in the specification, such that an overall reference character is not necessary.

The drawings and specification also are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include reference characters not included in the specification. A

replacement Fig. 1B has been included correcting reference 102 to 102X to correspond with the specification and fix a simple typographical error. The specification has been amended to include reference 800 as indicating the flow chart, which would have been obvious in light of the specification. The changes are not intended to alter the scope of the invention or be interpreted as a limitation on the claimed embodiments. These changes are supported by the specification and do not add new matter. Applicants therefore respectfully request that the objection of the drawings be withdrawn.

III. Rejection under 35 U.S.C. §103

Claims 1-4 are rejected under 35 U.S.C. §103(a) as being obvious over Applicants' disclosure of the prior art in view of *Brill* (WO 02/25723 A2). Applicants' claim 1 requires an overlay target defined by:

first and second test patterns, each including an upper grating layer and a lower grating layer, each grating layer including a series of substantially parallel lines, the upper grating lines of each test pattern aligned to be substantially parallel to the lower grating lines of the same test pattern, **each test pattern having an associated offset bias defined by the lateral offset of the upper and lower grating layers of the test pattern**, where a single line pitch is used for all gratings in all test patterns and **where the difference between the offset bias of the first test pattern and the offset bias of the second test pattern is substantially equal to the line pitch divided by four**

(*emphasis added*). Such limitations are not rendered obvious by the disclosed prior art in view of *Brill*.

The discussion of the prior art revealed problems with dead zones in measurements (p. 5, lines 1-5). *Brill* does not teach or suggest solving these dead zones. *Brill* instead teaches maximizing the sensitivity of a layer alignment measurement for a patterned structure on a semiconductor wafer having a specific nominal offset, or "nominal shift" S (p. 2, lines 7-28). *Brill* is attempting to maximize sensitivity when there is only a slight overlay error relative to the nominal shift. It can be desirable to maximize sensitivity in these cases because a substantial amount of information can be obtained when the overlay is near the nominal value. For instance, *Brill* is interested in deviations from nominal on the order of "the required resolution in the lateral shift measurement," such as "measurements of overlay registration with the resolution of less than 1 nm," where the pitch of grating must be greater than the feature dimension of 130 nm such that the error would be less than 1/130 and the offset bias less than 1/65, which

is much different than the 1/4 claimed in Applicants' claim 1 (p. 7, lines 26-28; p. 1, lines 18-21).

While *Brill* seeks to maximize the sensitivity near a specific nominal shift, the invention of Applicants' claim 1 is intended to have good sensitivity for all possible overlay offsets (Abstract). When the patterned structure drifts away from ideal overlay, there is a loss of information resulting in the aforementioned dead-zones (p. 7, lines 1-11). The invention of Applicants' claim 1 is an attempt to obtain acceptable values for all values of overlay, thereby eliminating dead-zones. The invention of Applicants' claim 1 does not try to maximize any particular overlay value as in *Brill*. Setting the difference between offset bias values to the pitch divided by four for any pitch has the important result that the combined optical response of the test patterns is sensitive to overlay for all values of overlay. As discussed in the application, a "consequence of the pitch/4 difference" is that "there is no overlay value at which the sensitivity to overlay vanishes (there are no measurement "dead-zones") (p. 7, lines 29-31). *Brill* does not teach or suggest that acceptable sensitivity can be obtained for all values of overlay simply by setting the offset bias differences to pitch/4. The invention of Applicants' claim 1 might not obtain a maximum sensitivity for a particular offset, as is the goal of *Brill*, but can obtain acceptable sensitivity at any offset. Setting pitch/4 for all patterns would go against the goals of *Brill* as it would not be optimal for all situations.

Brill also teaches that the diffraction used to measure the alignment is "affected by all geometrical aspects of the gratings" (p. 2, lines 10-14). *Brill* teaches on page 7, lines 6-14, that an approach to increase the sensitivity and reduce systematic measurement errors involves fitting the difference of simulated signatures to the difference of the measurements for differing measurement sites. Figs. 4-6 show different simulation tests as "functions of grating parameters" (p. 9, lines 29-30). Fig. 4 shows sensitivity as a function of grating depth and shift with a pitch of 800nm, wherein the sensitivity increases with increases in nominal shift, as the values of the sensitivity test T are taught to be "almost always monotonously increasing with the values of S" (p. 5, lines 24-25). Fig. 5 shows the sensitivity test as a function of grating depth and grating period. Fig. 6 shows the sensitivity test as a function of grating depth. Accordingly, *Brill* teaches that the way to maximize sensitivity to alignment error requires a complex

analysis of a number of pattern parameters to maximize sensitivity for a specific nominal shift. *Brill* does not teach or suggest that acceptable sensitivity can be obtained for all values of overlay simply by setting the offset differences to pitch/4, as required by Applicants' claim 1, as the optimizing process of *Brill* would require a fitting of a number of parameters to optimize a specific offset value. *Brill* not only fails to teach or suggest the limitations of claim 1, but using such a limitation would not achieve the goals of *Brill*. As such, Applicants' claim 1, and dependent claims 2-4, cannot be rendered obvious by the cited prior art in view of *Brill*.

Claim 5 is rejected under 35 U.S.C. §103(a) as being obvious over Applicants' disclosure of the prior art in view of *Brill* and further in view of *Niu* (US 6,855,464). Claim 5 depends from claim 1, which is not rendered obvious by the discussed prior art and *Brill* as discussed above. *Niu* is cited as teaching at least three gratings in three different angular orientations (OA p. 5). Such teaching would not make up for the deficiencies in the discussed prior art and *Brill* with respect to claim 1. As such, claim 1, and dependent claim 5, cannot be rendered obvious by the discussed prior art, *Brill*, and *Niu*, in any combination. Applicants therefore respectfully request that the rejection with respect to claims 1-5 be withdrawn.

IV. Conclusion

In view of the above, it is respectfully submitted that the application is now in condition for allowance. Reconsideration of the pending claims and a notice of allowance is respectfully requested.


The Commissioner is hereby authorized to charge any deficiency in the fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-1703, under Order No. TTI-32410. **A duplicate copy of the transmittal cover sheet attached to this Response to Office Action Mailed June 7, 2005, is provided herewith.**

Respectfully submitted,

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Dated: August 23, 2005

By: _____


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Amendments to the Drawings:

The attached sheet of drawings includes changes to Figs. 1A and 1B. This sheet, which includes Figs. 1A and 1B, replaces the original sheet including Figs. 1A and 1B.

Attachment: Replacement Sheet